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National Systematics Laboratory Report for Calendar Year 1991

Washington, D.C.

March 1992

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

ANNUAL REPORT
National Systematics Laboratory
Calendar Year 1991

Washington, D.C.
March 1992

U.S. DEPARTMENT OF COMMERCE
Barbara Hackman Franklin, Secretary

National Oceanic and Atmospheric Administration
John A. Knauss, Under Secretary for Oceans and Atmosphere

National Marine Fisheries Service
Dr. William W. Fox, Assistant Administrator for Fisheries

1991 HIGHLIGHTS

* Paper on distribution and biogeography of shallow-water fishes of Walter Shoals published

* Heterochrony in jaw morphology of needlefishes (Family Belonidae) described in recently published paper

* New species of moray eel described from Walters Shoals, Madagascar Ridge

* Three new tonguefishes (Symphurus) occurring in western Atlantic and eastern Pacific shallow-water areas were described

* Revision of viviparous halfbeaks of the genus Hemirhamphodon published

* New genus and species of spider crab described from Marianas Archipelago

* New species of burrowing shrimp (Upogebia) described from Florida shelf

* Doratopsis paralarvae of Chiroteuthis squids observed in-situ and collected intact using submersibles in the eastern North Pacific and western North Atlantic

* Largest recorded specimen of deep-sea squid, Taningia danae, captured in Georges Basin, western North Atlantic

* Paralarval ecology of euryhaline squid (Lolliguncula brevis) detailed in paper published in the Fishery Bulletin

* Dr. Isabel Canet, Carcinologist Emeritus, received the NEFSC Director's Award in May

* Systematics Laboratory zoologist participated in expedition to collect fishes from nearshore marine habitats in Pacific Panama

* Systematics Laboratory Scientific Illustrator featured in "Commerce People"

MISSION

The National Systematics Laboratory conducts taxonomic research on marine organisms of economic and ecological value to the United States. In addition to providing taxonomic information on species that are commercially important, scientific studies conducted by Systematics Laboratory personnel comprise significant contributions to the study of marine biodiversity by describing and naming new species as well as revising existing names and descriptions based on new information. Because many important species are widespread or migratory, our research is world-wide.

Accurate taxonomic information is the critical first step in recognizing individual species. Additionally, this information provides an understanding of the diversity of marine communities and is the necessary basis for proper management of our nation's living marine resources. Without a clear understanding of what individual species look like, where they are found, and what their names are, we cannot collect accurate statistics, develop reasonable national fishing and conservation regulations, set catch limits, or begin to understand the complexity and diversity of marine communities.

The Systematics Laboratory is involved actively in studying the taxonomy and biodiversity of fishes, crustaceans, and squids. We have a permanent staff of four scientists, a scientist emeritus, two museum specialists, a scientific illustrator, and a secretary. Two visiting investigators and two summer aides are included along with the permanent staff at the end of this report.

A unit of the Northeast Fisheries Science Center, National Marine Fisheries Service, we are located in the Smithsonian Institution National Museum of Natural History, Washington, D.C., where we can take advantage of one of the world's leading systems of collections, libraries, equipment, and facilities that are designed specifically for taxonomic and systematic research. The opportunity to meet and communicate with other taxonomic experts who reside in or visit the Smithsonian keeps the staff of the National Systematics Laboratory current on the latest ideas and techniques in the field. As Smithsonian Research Associates, scientists of the Systematics Laboratory expand Smithsonian scientific capabilities and help build and curate Smithsonian collections.

The Systematics Laboratory has two major responsibilities, research and service. Our research produces two principal products: 1) worldwide and regional taxonomic monographs, which are scholarly documents that identify, describe, and catalogue the diversity of species within selected taxa of marine organisms of commercial or ecological importance; and 2) various aids to

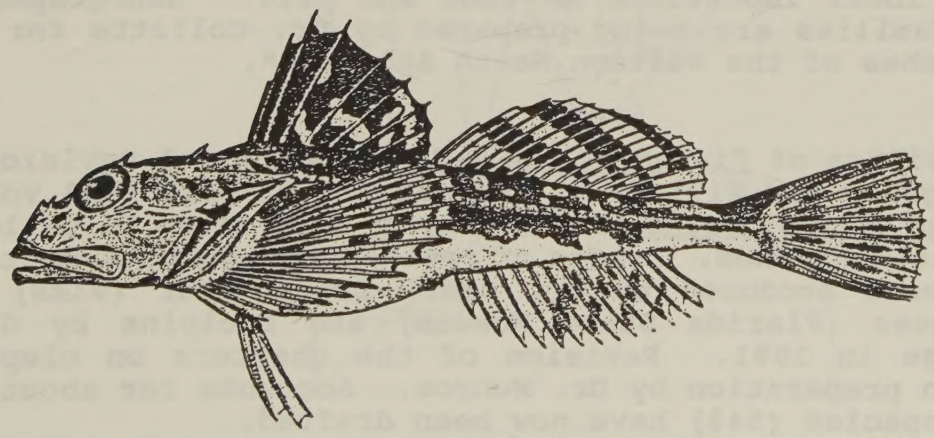
identification. These documents provide the necessary information for non-specialists to recognize and identify marine organisms.

The Systematics Laboratory serves many public as well as private institutions and individuals worldwide by providing expert identifications and information for a diversity of marine organisms including, but not limited to, the groups we study. We also review and comment upon manuscripts for scientific journals and for colleagues in the National Marine Fisheries Service, other agencies, and academia. Our staff evaluates research proposals for the National Science Foundation, Sea Grant, and similar research funding agencies.

In addition to these activities, staff members serve as officers of various scientific associations and participate in university affairs as research associates and adjunct professors.

HISTORY

The origin of the National Systematics Laboratory can be traced back to 15 August 1942, when Samuel F. Hildebrand moved into the Division of Fishes of the National Museum of Natural History to continue his ichthyological research for the Department of the Interior's Bureau of Fisheries; this followed the merger of the Bureau of Fisheries fish collection with that of the U. S. National Museum. The Laboratory, then the National Center for Systematics, was transferred from the Department of the Interior to the National Oceanic and Atmospheric Administration in 1970 and renamed the National Systematics Laboratory. The Laboratory is administered by the Northeast Fisheries Science Center, National Marine Fisheries Service, but also is responsible to the National Marine Fisheries Service Research Council and other regional Fisheries Science Centers.



Longhorn sculpin, Myoxocephalus octodecimspinosus (Mitchill)

RESEARCH

Fifteen papers by NSL scientists were published in calendar year 1991 (listed at end of this report). Research completed in 1991 and earlier has led to 17 more papers that are now in press and eight additional manuscripts were completed. Major accomplishments in 1991 are listed below for each investigation.

FISHES

Pelagic fishes of great importance to man live in the highly productive surface layers of the ocean where species tend to grow large and range widely. Emphasis is devoted to studying the anatomy and systematics of scombroids, the group that includes the tunas, Spanish mackerels, bonitos, and mackerels. Although many of the species have been known for a long time and an extensive literature treats them, detailed anatomical descriptions and comparisons are few, incorrect scientific names are often used, geographical ranges for many are not delimited precisely, and poorly documented classifications are current. The giant tunas, bonitos, Spanish mackerels, and double-lined mackerels found around the world have been treated by Dr. Collette and colleagues in a series of monographs and papers.

Studies of another group of ecologically and commercially important pelagic fishes, the clupeoids (anchovies, herrings, and sardines) have begun by Dr. Munroe with an investigation of the species of Spanish sardines (Sardinella) occurring in the Gulf of Mexico. Present research has focused on identification of useful diagnostic characters for recognition of the species occurring in the western Atlantic.

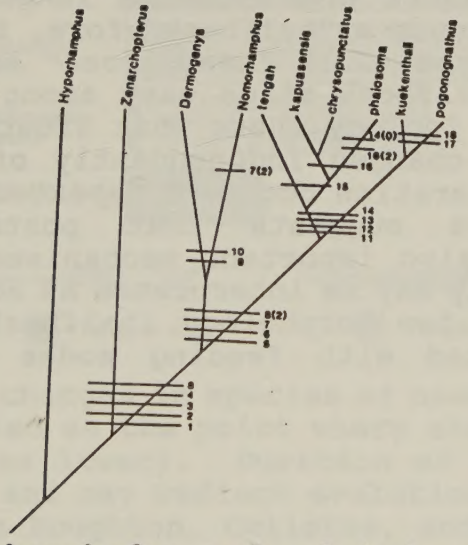
Several other groups of fishes are also under study and review. These include halfbeaks (Hemiramphidae) and needlefishes (Belonidae), abundant fishes, which are important forage species and are of local importance as food and bait. Monographs on these two families are being prepared by Dr. Collette for the series, "Fishes of the Western North Atlantic".

1. Revision of Fishes of the Gulf of Maine.- A revision of Henry B. Bigelow and William C. Schroeder's classic 1953 volume Fishes of the Gulf of Maine is underway by Drs. Bruce B. Collette and Grace Klein-MacPhee. Drafts of revised accounts for sections on sharks were produced by Dr. Steve Branstetter (VIMS) and George Burgess (Florida State Museum) and sculpins by Grace Klein-MacPhee in 1991. Revision of the chapters on clupeoid fishes is in preparation by Dr. Munroe. Accounts for about 127 of the 236 species (54%) have now been drafted.

2. Two species of double-lined mackerels (Grammatorcynus).- A paper begun with Mr. Gary Gillis, Smithsonian Vertebrate Zoology summer intern in 1989, was accepted for publication in the Fishery Bulletin. This paper describes osteological differences between the two species of Grammatorcynus, re-defines the genus and both species, and summarizes the literature on both species.

3. FAO and UNESCO.- The Systematics Laboratory continued to support the efforts of international organizations to make the results of systematic research available to a wider audience. Accounts of seven families in the eastern tropical Atlantic completed by Drs. Collette and Cohen in 1980 for a checklist (CLOFETA) were finally published by UNESCO. Also, accounts for six families were prepared by Dr. Collette for FAO Species Identification Sheets for the east central Pacific.

4. Fishes of Walters Shoals.- Walters Shoals, a shallow-water seamount 400 nautical miles south of Madagascar and 600 nm east of South Africa, is part of a chain of six island groups and seamounts that extend along the West Wind Drift from the Tristan da Cunha group in the South Atlantic to île Amsterdam and île St.-Paul in the Indian Ocean. The shallow-water fishes of Walters Shoals were sampled with a number of techniques during cruise 17 of the Soviet oceanographic vessel Vityaz in 1988. The shallow-water fish fauna of Walters Shoals consists of about 20 species, including seven endemic to parts of the West Wind Drift chain, three of which are undescribed. A paper on the Walter Shoals shallow water fishes by Bruce Collette and N. V. Parin (Institute of Oceanology, Moscow) was published in 1991 along with a description of the second undescribed species, a moray eel. A manuscript was completed and submitted describing the third undescribed species, a midwater snapper.



Cladogram of Hemirhamphodon and related genera of halfbeaks and the species of Hemirhamphodon (from Anderson and Collette).

5. Tonguefish taxonomy.- Tonguefishes (Symphurus) are small to medium-sized flatfishes comprising significant portions of the demersal fish faunas inhabiting sandy and muddy substrates in coastal seas of the New World. More than 45 species of tonguefishes are recognized currently in the eastern Pacific and western Atlantic, including several undescribed species. In 1991, a paper (with Ms. Martha Nizinski, Systematics Laboratory and Dr. Madhu Mahadeva, University of Wisconsin at Oshkosh), which described a new eastern Pacific species of tonguefish, was published. Another paper, resolving systematics of western Atlantic species of the Symphurus plagusia complex, was published in the Fishery Bulletin. This paper revealed that the previously held concept, of only one widespread species, was incorrect and that actually four species, two of which were previously undescribed, are included in this complex. A manuscript, describing the patterns of interdigitation of dorsal-fin pterygiophores and neural spines occurring in 69 of 71 species presently recognized in the genus, was also accepted for publication. This paper represents the first detailed discussion and evaluation of this character, based on examination of radiographs for over 4200 specimens, as a diagnostic character in distinguishing individual species or species groups within Symphurus.

6. Viviparous halfbeaks of the genus Hemirhamphodon.- A paper begun with Mr. William D. Anderson, III, Smithsonian Vertebrate Zoology summer intern in 1988, was published. Six species are recognized, including two considered doubtful and two previously undescribed.

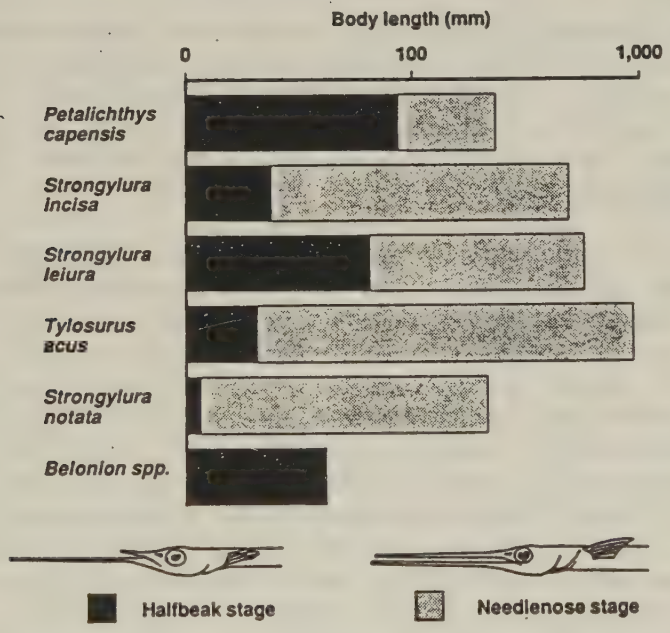
7. Heterochrony in jaw morphology of needlefishes (Belonidae).- The jaw morphology of needlefishes (Beloniformes: Belonidae) passes through distinctive ontogenetic stages. When hatched, larvae have short jaws of equal length. The lower jaw first elongates to produce a "halfbeak" form, then the upper jaw elongates to produce the adult "needlenose" morphology. Onset and duration of the halfbeak stage vary among belonid species. A paper in Systematic Zoology shows that growth trajectories of upper and lower jaws changed independently of each other, and that neoteny and acceleration occurred repeatedly during belonid evolution. Evidence suggests that postdisplacement and predisplacement were also important mechanisms. The resulting morphological diversity may be interpreted as adaptations to food availability, because jaw morphology (halfbeak vs. needlenose) seems to be correlated with feeding modes (planktivory vs. piscivory).

8. Type specimens of clupeoid fishes.- A catalogue of type specimens of clupeoid fishes in the collection of the United States National Museum is in preparation by Dr. Munroe.

9. Antarctic Liparididae.- Dr. David Stein, Biology Program Director, National Undersea Research Program, has taken up part-time residence at NSL to continue his taxonomic studies on Antarctic Liparididae, with funding from the National Science Foundation which has been transferred to NSL.

10. Biology of tonguefishes in Indian waters.- A manuscript by Dr. Rajaguru, Visiting Scientist at NSL, detailing the biology of two co-occurring cynoglossine tonguefishes (Cynoglossus) from Indian waters was revised and re-submitted to Fishery Bulletin.

11. Cetacean research.- A manuscript by Dr. Rajaguru on a sessile barnacle from a bottlenose dolphin in the Bay of Bengal, India, with a summary of recorded occurrences on cetaceans, has been accepted for publication in the Fishery Bulletin. Two manuscripts, one describing cetacean strandings along Indian coasts and the other on veneration of whales and dolphins in India, are also in preparation by Dr. Rajaguru.



Ontogenetic shape changes in species of needlefishes. Transition points are estimated as the point where shape index = 0.5 (upper jaw half as long as lower). Duration of halfbeak stage varies widely among taxa and may reflect evolutionary responses to food availability (from Boughton, Collette, and McCune).

CRUSTACEANS

The groups of crustaceans most directly important to fisheries are the shrimps (mainly penaeoid species), lobsters, and crabs. Research on shrimps in the National Systematics Laboratory is conducted by Dr. Isabel C. Canet (Pérez Farfante), and that on crabs, lobsters, and other decapods by Dr. Austin B. Williams.

Shrimp fisheries are the second most valuable segment of the U. S. fishing industry. In 1990, domestic commercial landings amounted to 346,494,000 lbs (heads-on-weight) with an ex-vessel value of $491,433,000, and an additional 501,348,000 lbs (heads-off), with a value of $1,658,691,000, were imported. Recognition of the importance of commercial fisheries, and of the ecological role of shrimp in marine productivity, has stimulated research on various aspects of shrimp biology, and resulted in an improvement of fishery management efforts. Much has been learned about morphology, physiology, and larval cycle of a number of shrimp species. However, the main recent contribution to increase of shrimp supplies to the market has been the advance in shrimp farming, well established in various Central and South American countries, which now supply 25% of the world production. Commercial shrimp rearing has demonstrated a real need for further investigations on reproduction (gonad maturation, induction of spawning), food requirements, stock improvement, and pest and disease control, which often plague the shrimp farm facilities. Current studies in the Systematics Laboratory, not only aim to satisfy the need for precise species identification, but to advance our knowledge of the first phases of the reproduction process.

Crabs and lobsters are among the most conspicuous animals in catches from heavily fished marine waters of the world. In combination, they yield about half of the tonnage of domestic crustacean fishery production and nearly half of its dollar value. In their adult phase they are prominent members of bottom communities, ranging from marshlands and estuaries through nearshore systems to the deep sea, and they occupy dominant positions in the biological communities where they live. A huge literature exists for some species that are seemingly well known, but because of faulty oversimplified descriptions and distribution ranges, community relationships of many such species may be poorly understood. Still other species have been uncritically identified, and many have never been recognized and described.

1. Burrowing shrimps from the Gulf of Mexico and Caribbean.- A small burrowing shrimp taken in box core samples from the Florida Shelf Mississippi-Alabama-Florida (MAFLA) Outer Continental Shelf Studies (OCS) was described by Dr. Williams in collaboration with R. W. Heard, Gulf Coast Research Laboratory.

2. Rare crabs from the Marianas Islands.- Field studies of the Resource Assessment Investigation of the Mariana Archipelago (RAIOMA) program in the western North Pacific Ocean, conducted by the National Marine Fisheries Service, Southwest Fisheries Science Center, Honolulu Laboratory, included rare crabs in incidental catches. From these samples, Dr. Williams and R. B. Moffitt, of the Honolulu Laboratory, described a new genus and species of spider crab, and discussed distribution of a recently described homoloid crab belonging to a new family, with remarks on features distinguishing the families of Homoloidea, including a key for their identification.

3. Fossil crab.- A new species of calappid crab from the Late Cretaceous of the Western Interior of the United States was described in collaboration with Dr. G.A. Bishop, Georgia Southern University. Relationships to other members of the fossil species group were discussed.

4. History of crab research in North America.- From an oral presentation in a symposium on History of Carcinology sponsored by the Crustacean Society during the 1990 meeting of the American Society of Zoologists, Dr. Williams developed a manuscript entitled "Reflections on crab research in North America since 1758" that will be published in a symposium volume.

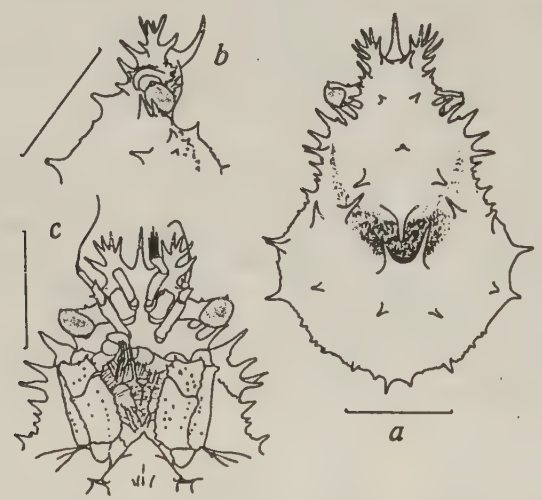
5. Nomenclatural problems.- Dr. Williams provided comments on two cases before the International Commission on Zoological Nomenclature that concern crustaceans.

6. Distinguishing juvenile stages of Cancer crabs.- Juvenile stages of the Jonah crab, Cancer borealis, and the Atlantic rock crab, C. irroratus that occur together in the western North Atlantic, have heretofore been indistinguishable. Dr. Williams and Dr. R. Wahle, Brown University, collaborated in devising a method for distinguishing these juvenile stages. A manuscript has been accepted for publication.

7. Mud shrimps of the western Atlantic.- A monograph on mud shrimps, Upogebiidae, of the western Atlantic is nearing completion. Study of specimens collected by recent oceanographic workers, and those deposited in research collections of museums of the western hemisphere and Europe, shows that 20 species occur in the region. Eight of these are new to science. Descriptions, illustrations, keys to identification, distribution, and relationships of the fauna to that in other regions are discussed by Dr. Williams.

8. Submarine-vent crustaceans.- Hydrothermal vents, as well as cold brine and hydrocarbon seeps in the world oceans, have become major foci of oceanographic discovery and research in the past 15 years. With the aid of increasingly sophisticated exploratory techniques and equipment operated by NOAA and other agencies, these features have come to be recognized as widely associated with tectonically active zones of the ocean floor. The vents and seeps have been in existence since very early in the earth's history, and through geological and biological processes have had profound influence on the oceans. Through time, representatives of many organismic groups have adapted to unique systems of nutrition in these environments at depths beyond the reach of light, and among the groups represented are decapod crustaceans. From the first discovery of these features, Dr. Williams has been describing decapods collected from them in a series of papers. New discoveries from brine and hydrocarbon seeps in the Gulf of Mexico are being sent to him for study.

9. Catalog of genera of penaeoid shrimps.- During 1991, Dr. Canet completed synopses of 15 genera for inclusion into a catalogue of genera of penaeoid shrimps. For each of about 50 generic-groups to be covered in the catalogue, the following information is included: original reference, synonyms, type-species, gender, list of nominal species, and distribution. Additionally, phylogenetic relationships based on cladistic studies will be established for groups of genera and various higher taxonomic categories. Material of representative genera was selected and illustrations prepared during 1991. Discussions have been held with the Smithsonian Institution Press about publication of the catalogue. A manuscript describing hermaphroditism in the white shrimp, Penaeus vanamei, was also accepted for publication.



Bothromaia griffini, new genus and species of spider crab from the Mariana Islands; a- dorsal view; b- side of head; c- lower view of head; scales 1 mm.

SQUIDS

Cephalopods are very important, both to the marine ecosystem and to humans. They are abundant predators some of which are large, active, and voracious. Conversely, cephalopods are important prey for many marine mammals, birds, and fishes, including economically important species. Substantial squid fisheries have existed in North America almost exclusively to provide bait for other fisheries. Cephalopods also are important as food for people in many parts of the world. Furthermore, they are important in biomedical research; much of what is known about neurophysiology results from experiments with the giant axon of the squid Loligo.

Squid fisheries, both in U.S. waters and worldwide, concentrate on species from two families, Loliginidae and Ommastrephidae. In the United States, these fisheries currently are primarily an export industry, although utilization in the United States is increasing.

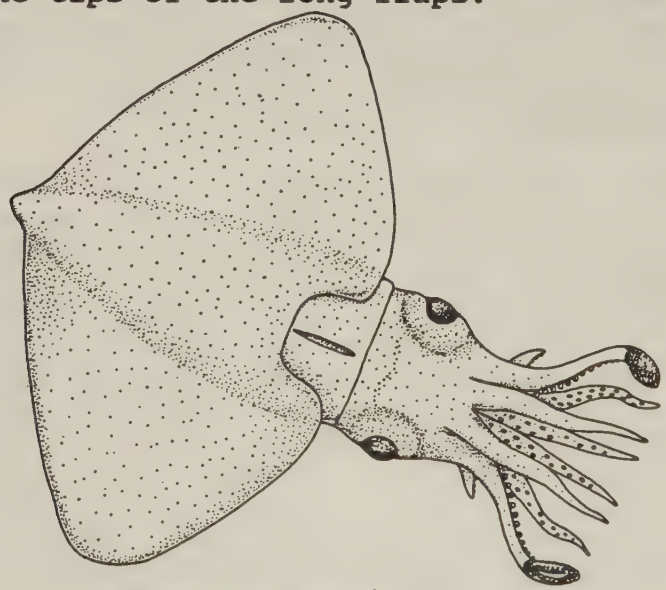
Loliginids include many species of demersal squids which attain medium to large sizes and which are both common and abundant on continental shelves. The loliginids in U. S. waters include species that are harvested commercially (the average yield from the east coast U. S. fishery, 1988-1990, was 19,200 tons), but which are quite difficult to identify. Additionally, there are several other species of small loliginids found in U.S. waters. Generic relationships of the species are presently very confused. Four conflicting classification schemes have been proposed, based on single characters, on regional material, or on arguments that have been institutionalized in outdated literature. Because the diverse family Loliginidae is cosmopolitan, the only way to resolve relationships within it adequately is by a worldwide systematic review of the taxonomic characters. Dr. Michael Vecchione, together with several colleagues, is reviewing the loliginids.

Commercially and ecologically, the most important ommastrephids in U. S. waters belong to the genus Illex. The average catch of Illex in U. S. waters in 1988-1990 (6800 tons) was limited because of market domination by large catches of Illex from the Falkland Islands. There are four groups of Illex in the western Atlantic which are more or less distinct morphologically. It has been proposed that these morphotypes are separate species, although some authors still consider them to be subspecies. These arguments, based primarily upon preserved specimens, have not fully considered other components of morphological variability (e.g., geographic, seasonal, sexual, ontogenetic). Dr. Vecchione is conducting a study of Illex which will treat several components of variability from fresh as well as preserved material.

1. Volume on Cephalopod Systematics and Biogeography.- Together with Prof. Nancy Voss, University of Miami, and Dr. Ronald Toll, University of the South, Dr. Vecchione is editing a volume on Cephalopod Systematics and Biogeography. The multi-authored volume, which will be issued as a Smithsonian Contribution to Zoology, results from a two-week international workshop conducted at George Washington University and sponsored by the Smithsonian Institution.

2. The Gilbert L. Voss Memorial Issue.- This memorial issue of the Bulletin of Marine Science, to be published in honor and recognition of Prof. Gilbert L. Voss (1918-1989), is edited by Dr. Vecchione together with Dr. Clyde F. E. Roper of the Smithsonian Institution. The volume is comprised of papers from two sources: (1) former students and colleagues presenting a variety of marine biological topics, and (2) a symposium on cephalopods convened in honor of Gil Voss.

3. A tale of two species.- "Doratopsis" paralarvae of Chiroteuthis were observed in-situ and collected intact using a remotely operated vehicle (ROV) in the eastern North Pacific and a manned submersible in the western North Atlantic. These specimens, the first with complete tails, show remarkable interspecific differences in tail morphology but little intraspecific variability. Eleven Pacific specimens had very long rigid tails characterized by pairs of large, fluid-inflated, lateral pouches separated by 4-6 flat, rounded, lateral lobes of tissue (referred to here as flaps, not finlets). The single Atlantic specimen has a long, rigid tail, with long, pointed flaps staggered along its sides, each separated by 4-6 short, pointed flaps; when alive, it had what appeared to be very small pouches at the tips of the long flaps.



Dorsal view of the deep-sea squid, Taningia danae Joubin, 1931

4. A huge squid.- The capture of a very large deep-sea squid, Taningia danae Joubin 1931, by a commercial trawl in Georges Basin, western North Atlantic, prompted a study of nomenclature and distribution of the species as reported in the literature. Previously published records indicate a world-wide warmwater distribution excluding the western North Atlantic, Caribbean Sea, Mediterranean Sea, and Central Pacific. The Georges Basin specimen, the largest recorded T. danae (mature female, 160 cm mantle length), together with 16 smaller specimens caught in midwater trawls and deposited in the collections of the National Museum of Natural History (NMNH), extend the known distribution into the western North Atlantic. Additional specimens in the NMNH collections also document distribution in the central North Pacific. Observations of bioluminescent flashes from the arm-tip photophores of a live specimen captured off Hawaii are reported for the first time in a paper by C.F.E. Roper and M. Vecchione accepted for publication. A permanent display of the large specimen in the Smithsonian's National Museum of Natural History is planned.

SCIENTIFIC ILLUSTRATION

Illustrations of fishes, crabs, and cephalopods, drawn by Ms. Keiko Moore, Scientific Illustrator, appeared in six papers published by laboratory scientists in 1991. Additional figures were also drawn for three manuscripts accepted or submitted for publication. During 1991, Ms. Moore also continued work on figures (approximately 180) for a major monograph on mud shrimps that is in preparation by Dr. A. Williams.

Ms. Moore translated scientific papers, mostly from Japanese (less often, Chinese), for Systematics Laboratory scientists, and Smithsonian scientists and librarians. Additionally, Ms. Moore served as an interpreter and guiding official for visitors to the Systematics Laboratory and the National Museum of Natural History from Japanese museums and universities.

Ms. Moore presented a two-hour lecture demonstration of the making of Japanese woodblock prints at the Federal Reserve Board of Governors in Washington, DC, as part of the celebration of Asian Pacific American Heritage Month.

Ms. Moore presented a three-hour lecture demonstration of the making of Japanese woodblock prints at the Walters Art Gallery (Asian Museum) in Baltimore, MD, in conjunction with the main exhibit of late 19th century Japanese woodblock prints. The lecture was videotaped for possible broadcast with PBS (preliminary discussions underway) and for use in printmaking courses at art schools and colleges.

Ms. Moore presented a two-hour lecture demonstration of sumi-e (Japanese brush painting) and two, one-hour workshops of the same subject at the National Museum of Women in the Arts of Washington, DC, in conjunction with the feature exhibit of paintings by Ms. Migishi, a renowned Japanese artist. The activities were organized by the Embassy of Japan.

Ms. Moore continued to serve as a member of the Program Committee of Asian Pacific American Heritage Month which organizes the annual Asian Pacific American Heritage month celebration.

FIELD WORK

Drs. Austin Williams and Gale A. Bishop (Georgia Southern College) collected fossil decapod crustaceans from late Cretaceous deposits in northwestern South Dakota during July.

Field work on cephalopod projects continued during this year. In August, Dr. Vecchione travelled to the Smithsonian Marine Station in Florida to continue the field work for a project designed to collect fresh specimens of paralarval cephalopods from the Straits of Florida.

In July, Dr. Munroe collaborated with scientists from Panama, the Smithsonian Tropical Research Institute, and the Inter-American Tropical Tuna Commission Laboratory at Achotines, Panama, collecting clupeid, engraulid, pleuronectiform fishes, and other groups, for on-going research projects. Fishes were collected from a variety of marine habitats using a combination of sampling devices including trawling, beach seining, and rotenone.

SERVICE

In addition to their research responsibilities, scientists from the Systematics Laboratory serve the scientific community and the public in other ways. The primary service functions of this Laboratory are to provide expert identifications for groups of fishes, crustaceans, and squids in which we specialize, and to furnish information on these animals. We assist visitors in the use of the national collections. We review manuscripts for scientific publications, for colleagues in NMFS, and other agencies. Finally, we assist staffs of the divisions of Fishes, Crustacea, and Mollusks of the National Museum of Natural History with curation and loans, especially material collected by NMFS.

IDENTIFICATIONS

ORGANIZATION	CONTACT
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Atlantic City Press	R. Degener
Atlantic Reference Collection, St. Andrews	K. Sulak
Atlantic States Marine Fisheries Commission	H. Austin, P. Perra, S. Leatherwood
Barter Trade, N.Y.	J. Sidebotham
Bell Berog Seafood, Minneapolis	B. Eisenberg
California Academy of Science	W. Eschmeyer
Cape Cod Mosquito Control Project	M. Hayes
Cent. Invest. Biolog. Baja California Sur, Mexico	P. Whitehead
Center for Marine Conservation	E. Norse
Channel 9 News, Wash., D.C.	T. Murphy
Chemonics Inc.	B. Basson
Cl. Peun. School of Veterinary Medicine	G. Schad
Cornell University	J. Webb
Cousteau Society	?
Cuban National Museum, Havana	A. DeBouchet
Dalhousie University	S. Smith
Down East Magazine	M. Brosnan
Duke University	W. Kier
Eleanor Roosevelt High School, Hyattsville, MD	T. Myers, A. Villaruz
Environmental Protection Agency	W. Davis, W. Kruczynski, R. Wilhour
Fantastic Facts	?
FAO Regional Fishery Program, Fiji	J. Ianelli
Field Museum of Natural History, Chicago	J. Voight
Florida Atlantic University	T. Gwaltney, D. Borklund, R. Brooks
Florida State Museum, Gainesville	R. Portel
Food and Drug Administration	S. Whetstone, M. Snyder, J. Geltman, M. Meltzer
Fundacion Cientifica Los Rogues	B. Rodriguez
Georgia Southern University	G. Bishop
Grand Mariner, Ltd., College Station, TX	J. Hayes
Hawaii Fisheries Council	R. Harman
Hebrew University, Israel	A. Ben-Tuvia
House of Representatives	M. Quigley
ICLARM	D. Pauly
Institute of Oceanology, Moscow	N.V. Parin
Institute of Paleontology, Moscow	N.N. Parin, A. Bannikov
Istituto di Tecnologia della Pesca, Italy	P. Jareb

INFORMATION

ORGANIZATION	CONTACT
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Laboratoire Arago, France	K. Mangold
Los Angeles County Museum	D. Cohen, F. Gago
Monterey Bay Aquarium Research Institute	B. Robison
Museum of Comparative Zoology, Harvard	K. Hartel
National Archives	L. Baume
National Fisheries Institute, VA	R. Collette
National Geographic Magazine	A. McKellum, H. Hoffmann
National Institute of Conservation	A. Torres
NMFS, Beaufort	T. Murphy
NMFS, Charleston	F. van Dolah
NMFS, Gloucester	D. Mason
NMFS, Miami	D. Goldman, L. Massey, W. Richards
NMFS Office of Scientific Publications	W. Hobart
NMFS, Sandy Hook	W. Mckenzie
NMFS, Seattle	R. Waples
NMFS, Washington	B. Hackley, M. Tillman, T. MacIntyre
NMFS, Woods Hole	G. Freed, T. Fradi, J. Gibson, D. Flescher
National Museum of Canada	C. Renaud
National Museum of Chile	H. Ochoa
National Zoological Park	J. Francis
New York, Dept. Natural Resources	C. Zawacki
NOAA, National Undersea Research Program	D. Stein
NOAA-Data Management	M. Fraser
NOAA, ELMER Project, Annapolis	L. Andreas, D. Field
NOAA, Office of Civil Rights	6 Students
Ohio State University	C. Herdendorf
Patridge Productions, London	?
Performance Contracting, Inc.	P. Reyes
Portland Press Herald	C. Canfield
Private Individual	J. Coni, I. Barr
Radford University	C. Brown
Royal Ontario Museum	S. Graham
San Diego Natural History Society	R. Wetzger
Scott, Foresman, Chicago,	L. Rhodes
Scully Science Center, Islip, N.Y.	E. Rulseh, C. Safina
Seafood Co., Mayport, FL	M. Roland
Seafood Leader,	A. Templin, W. Lee
Seafood Leader, Seattle Wa.	L. Comai
Sea Grant	G. Fritz
Senckenburg Museum	T. Ziegler
Smithsonian Environmental Research Center	L. Smith

INFORMATION ORGANIZATION	CONTACT
Smithsonian Institution	R. Rubinoff, B. Kensley, C. Phillips, I. Farfant, R. Goddard, W. Hart, R. Aronson
Smithsonian Tropical Research Institute	N. Knowlton
Sorforg Center, S.F.	M. Pollinger
State University New York, Stony Brook	E. Schultz
Texas Seafood	P. Clark
U.S. Customs, N.Y.	T. Brady
U.S. Fish & Wildlife Service, Law Enforcement, Baltimore	P. Rogers
U.S. Fish & Wildlife Service	I. Blandon, T. Fritts
U.S. Forest Service	L. Forbis
U.S. State Department	D. Proops
University of Chicago	B. Bloc
University of Connecticut, Marine Lab., Groton	P. Brown
University of Florida	R. Carthy
University of Hawaii	D. Greenfield
University of Kansas	E. Wiley
University of Maryland	L. Hall, E. Dudley
University of Michigan, Museum of Zoology	W. Fink
University of Nevada, Las Vegas	K. Dupre
University of Rhode Island	W. Macy
University of San Marco, Peru	F. Cardoza
University of South Florida, Tampa	S. Otwell
University of Southwestern Louisiana	D. Felder
University of Texas Marine Biomedical Institute	P. Lee, R. Hanlon
University of Texas, El-Paso	L. Jones
University of Texas, Port Aransas	D. Crompton
University of Tokyo	M. Omori
University of Washington	T. Pietsch
Virginia Institute of Marine Science	J. Olney, H. Banford, J. Vieira, C. Tabbit
Virginia Marine Resources Commission	D. Boyd
Walter Reed	D. Crimmon
Western Australian Museum, Perth	J. Allen
Winrock International	O. Bhatt
World Bank	L. Sprugne
World Book Encyclopedia, Chicago	F. Wu, M. Goldberg, B. Sparks

MANUSCRIPTS REVIEWED

Reviews of 32 manuscripts were provided for:

Antarctic Research Series
Bulletin of Marine Science
Canadian Journal of Fisheries and Aquatic Sciences
Copeia
Estuarine, Coastal and Shelf Science
Environmental Biology of Fishes
Fishery Bulletin, U.S.
Ichthyological Exploration of Freshwaters
Journal of Crustacean Biology
Journal of Paleontology
National Geographic Research and Exploration
Northeast Fisheries Center
Oceanologica Acta
Proceedings of the Biological Society of Washington
Smithsonian Contributions to Zoology
South African Journal of Marine Science

40 manuscripts, two Ph. D. dissertations, and one undergraduate thesis were also reviewed for authors at their request.

RESEARCH PROPOSALS REVIEWED

30 proposals were reviewed for the following organizations:

Hawaii Undersea Research Laboratory
Louisiana Sea Grant College Program
National Geographic Society
National Marine Fisheries Service, SERO, Gulf of Mexico Marine Fisheries Institute (MARFIN)
National Science Foundation
National Science Foundation, Biological Research Resources
NOAA-NURC, Wilmington, NC
Smithsonian Institution Postdoctoral Fellowship Program
Smithsonian Institution Predoctoral Fellowship Program
Smithsonian Tropical Research Institution

PROFESSIONAL ACTIVITIES

AMERICAN ASSOCIATION FOR ZOOLOGICAL NOMENCLATURE

Dr. Williams served as president during 1991. Dr. Vecchione was elected councilor and participated in the annual meeting.

AMERICAN FISHERIES SOCIETY

Dr. Williams served as a member of the American Fisheries Society Committee on Names of Aquatic Invertebrates.

AMERICAN LITTORAL SOCIETY

Dr. Collette continued to serve on the scientific advisory council.

AMERICAN SOCIETY OF ICHTHYOLOGISTS AND HERPETOLOGISTS

Drs. Collette and Rajaguru attended the annual meeting held at the American Museum of Natural History in New York City in June. Dr. Collette chaired a session of papers, participated in the Board of Governors and Business meetings, and presented a paper on the shallow water fishes of the West Wind Drift Islands. Dr. Rajaguru also presented a paper on pigmentation and morphological anomalies in flatfishes.

BIENNIAL CONFERENCE ON BIOLOGY OF MARINE MAMMALS

Dr. Rajaguru presented a poster on entanglement of smaller cetaceans in the gillnet fishery along the Indian coasts at the ninth biennial conference held in Chicago in December.

BIOLOGICAL SOCIETY OF WASHINGTON

Dr. Williams served as a member of the Council and continued as Custodian of Publications.

Dr. Collette participated in meetings as a member of the Council.

Dr. Vecchione participated in annual and executive council meetings and continued to serve as Treasurer of the Society.

CEPHALOPOD INTERNATIONAL ADVISORY COUNCIL

Dr. Vecchione continued to serve as an elected member of the council.

CONGRESS OF EUROPEAN ICHTHYOLOGISTS

Drs. Collette and Munroe attended the Seventh International Ichthyology congress in the Hague, The Netherlands. Dr. Collette presented a paper on the shallow water fishes of the West Wind Drift Islands and Dr. Munroe presented one on dorsal pterygiophore interdigitation patterns in tonguefishes.

CYBIUM

Dr. Collette continued as a member of the Editorial Board.

FISHERY BULLETIN

Dr. Collette served as a member of the Best Publications Award Committee.

FISHES OF THE WESTERN NORTH ATLANTIC

Dr. Collette continued to serve as Chairman of the Editorial Board.

INTERNATIONAL CONFERENCE OF NATURAL SCIENCE ILLUSTRATION

Ms. Moore participated in a six day conference, organized by The Guild of Natural Science Illustrators, and held at Duke University, Durham, NC. More than 40 lectures, workshops, demonstrations, and field trips presented various illustration techniques including newly available materials, computer software, technical information, and copyright rules.

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

Dr. Vecchione was appointed as a member of the newly reconstituted Working Group on Squid Biology.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Dr. Vecchione represented NOAA at the United Nations Environment Program/World Resources Institute Consultation on a World Biodiversity Strategy in Keystone, CO, 14-17 July. He also participated as a NOAA representative in congressional testimony on biodiversity, 23 July.

SMITHSONIAN INSTITUTION

Drs. Collette and Munroe served as Research Associates in the Department of Vertebrate Zoology, Drs. Canet, Williams, and Vecchione in the Department of Invertebrate Zoology.

Dr. Collette delivered a one-hour seminar on the Tektite Program to the advanced diving class.

Dr. Vecchione served as co-advisor with Dr. Clyde Roper of the Smithsonian for NATO-CNR Advanced Fellow Patrizia Jaret of Istituto di Tecnologia della Pesca e del Pescato, Italy.

Dr. Williams served as a member of an advisory panel for the Smithsonian Oceanographic Sorting Center-National Science Foundation Division of Polar Programs cooperative systematic studies and analyses of Polar Biological Materials.

Ms. Moore presented a three-hour lecture and demonstration on the making of Japanese woodblock prints as part of the Celebration of Asian Pacific Heritage Month at the National Museum of Natural History.

Ms. Moore taught two six-week courses (in spring and fall semesters) in Shodo (Japanese calligraphy) at the Smithsonian's Resident Associate Programs.

Ms. Moore shared natural science illustration techniques with a Russian natural science illustrator from Leningrad (now St. Petersburg), who was on a three-month grant from the Smithsonian Institution.

SOCIETY FOR SYSTEMATIC ZOOLOGY

Drs. Collette and Vecchione served as co-chairs and Dr. Williams served as a member of the Fisheries Committee of Systematics Agenda 2000: Integrating Biological Diversity and Societal Needs.

TUNA CONFERENCE

Dr. Collette attended the 42nd Annual Tuna Conference at Lake Arrowhead, CA, and presented a paper on the systematic position of the wahoo.

OTHER MEETINGS ATTENDED

American Association for the Advancement of science
American Association of Zoological Nomenclature
American Fisheries Society, Annual Meeting of Committee on Common Names of Aquatic Invertebrates
American Fisheries Society, Potomac Chapter
American Institute of Biological Scientists
Environmental Protection Agency-NODOC Taxonomic Workshop
National Marine Fisheries Service, Board of Directors Biology Colloquium, Woods Hole
Ocean Conservation Forum
UNEP, Regional Consultation on World Strategy on Biodiversity, Keystone, Colorado
Washington Academy of Sciences
World Resources Institute

UNIVERSITY AFFAIRS AND TEACHING

BERMUDA BIOLOGICAL STATION

Dr. Collette taught a four-week course, "Biology of Fishes", to a class of 12 students from five countries at the Bermuda Biological Station in July.

ELEANOR ROOSEVELT HIGH SCHOOL, HYATTSVILLE, MARYLAND

Dr. Munroe served as advisor on two student science projects examining systematic problems of cynoglossine tonguefishes and achirid soles.

GEORGE MASON UNIVERSITY

Dr. Vecchione served as thesis advisor for Master's degree student and NSL Museum Specialist Deborah Rothwell.

MACQUARIE UNIVERSITY, SYDNEY, AUSTRALIA

Dr. Vecchione served as external thesis reviewer for Master's degree student Amanda Reid's thesis on systematics of Australian bobtailed squids.

MONTGOMERY BLAIR HIGH SCHOOL

Dr. Rajaguru is supervising a science fair project by Edwina Bhaskaran on sexual dimorphism in selected flounders.

UNIVERSITY OF SOUTH CAROLINA

Together with Dr. Clyde Roper of the Smithsonian Institution, Dr. Vecchione supervised a senior research project on paralarval squid taxonomy by Carrie Adams.

VIRGINIA INSTITUTE OF MARINE SCIENCE/ COLLEGE OF WILLIAM AND MARY

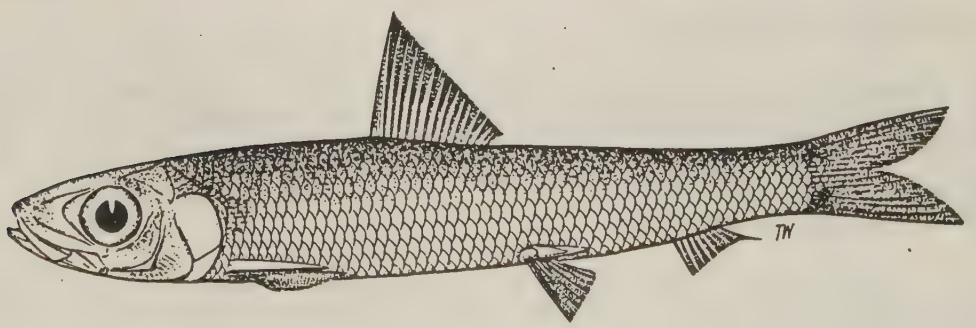
Dr. Collette conferred with Heidi Banford on her thesis project on halfbeak systematics and with Dan Scoles on his Ph.D. project on genetic variation in mackerels of the genus Scomber.

Dr. Munroe served as a member of the Associate Faculty and served on the Ph. D. dissertation committee of Jaoa Vieira on latitudinal gradients in estuarine fish communities in the western Atlantic.

Dr. Vecchione served as a member of the Associate Faculty and served as thesis advisor for a Master's degree student working on cephalopod paralarvae.

WASHINGTON, D.C., AND MARYLAND INTERMEDIATE SCHOOLS

Ms. Moore presented an informal talk and demonstrated scientific illustration techniques to eighth and ninth grade students from Washington, D. C. and nearby Maryland schools who were participants in the "1000 Civil Rights Group" of the I Have A Dream Foundation's program for disadvantaged young people. This experience was to provide students with an introduction to careers in science and to enhance basic skills and self esteem.



NATIONAL SYSTEMATICS LABORATORY PUBLICATIONS, 1991

Anderson, W.D., III and B.B. COLLETTE. 1991. Halfbeaks of the viviparous genus Hemirhamphodon (Teleostei: Hemiramphidae). Ichthyol. Explor. Freshwaters 2(2): 151-176

Bishop, G.A. and A.B. WILLIAMS. Necrocarcinus olsonorum, a new crab (Decapoda: Calappidae) from the Cretaceous Carlile Shale (Turonian), Western Interior United States. J. Crust. Biol. 11(3): 451-459.

Boughton, D.A., B.B. COLLETTE, and A.R. McCune. 1991. Heterochrony in jaw morphology of needlefishes (Teleostei: Belonidae). Syst. Zool. 40(3): 329-354.

COHEN, D.M. 1991. Families Argentinidae (pp. 235-238), Bathylagidae (pp. 239-240), Moridae (pp. 520-523), Gadidae (pp. 526-531), and Bregmacerotidae (pp. 524-525). In: Check-list of the Fishes of the Eastern Tropical Atlantic, ORSTOM, Paris. J.C. Quero et al., eds.

COLLETTE, B.B. 1991. Family Scombridae (pp. 978-996) In: Check-list of the Fishes of the Eastern Tropical Atlantic, ORSTOM, Paris. J.C. Quero et al., eds.

COLLETTE, B.B. and N.V. Parin. 1991. Shallow-water fishes of Walters Shoals, Madagascar Ridge. Bull. Mar. Sci. 48(1): 1-12.

COLLETTE, B.B. and N.V. Parin. 1991. Family Belonidae (pp. 592-597). In: Check-list of Fishes of the eastern Atlantic Tropical Atlantic, ORSTOM, Paris. J.C. Quero et al., eds.

COLLETTE, B.B. and N.V. Parin. 1991. Family Hemiramphidae (pp. 579-582). In: Check-list of Fishes of the eastern Atlantic Tropical Atlantic, ORSTOM, Paris. J.C. Quero et al., eds.

COLLETTE, B.B., D.G. Smith, and E.B. Böhlke. 1991. Gymnothorax parini, a new species of moray eel (Teleostei: Muraenidae) from Walters Shoals, Madagascar Ridge. Proc. Biol. Soc. Wash. 104(2): 344-350.

MUNROE, T.A. 1991. Western Atlantic tonguefishes of the Symphurus plagusia complex (Cynoglossidae: Pleuronectiformes), with descriptions of two new species. Fish. Bull., U.S. 89: 247-287.

MUNROE, T.A., M.S. NIZINSKI, and M.N. Mahadeva. 1991. Symphurus prolatinaris, a new species of shallow-water tonguefish (Pleuronectiformes: Cynoglossidae) from the eastern Pacific. Proc. Biol. Soc. Wash. 104(3): 448-458.

NATIONAL SYSTEMATICS LABORATORY PUBLICATIONS, 1991
(Continued)

VECCHIONE, M. 1991. Observations on the paralarval ecology of a euryhaline squid, Lolliguncula brevis (Cephalopoda: Loliginidae). Fish. Bull., U.S. 89(3): 515-521.

WILLIAMS, A.B. 1991. Comments on the proposed conservation of the specific name of Artemia franciscana Kellogg, 1906 (Crustacea, Branchiopoda). (Case 2728: see BZN 47:178-183, 48:57). Bull. Zool. Nomencl. 48(3): 246-247.

WILLIAMS, A.B. and R.W. Heard. 1991. Upogebia spinistipula, a new burrowing shrimp from box core samples taken on the Florida shelf, northeastern Gulf of Mexico (Decapoda: Upogebiidae). Proc. Biol. Soc. Wash. 104(1): 49-54.

WILLIAMS, A.B. and R.B. Moffit. 1991. Crabs from the Mariana Archipelago: Bothromaia griffini new genus and species (Brachyura, Majidae), and remarks on Poupinia hirsuta Guinot (Homoloidea, Poupiniidae). Proc. Biol. Soc. Wash. 104(3): 569-582.

PAPERS IN PRESS

COLLETTE, B.B. Families Batrachoididae, Belonidae, Coryphaenidae, Hemirhamphidae, Scombridae, and Xiphidae. FAO Species Identification Sheets, East Central Pacific.

COLLETTE, B.B. and G.B. Gillis. Morphology, systematics, and biology of the double-lined mackerels (Grammatorcynus, Scombridae). Fish. Bull., U.S.

COLLETTE, B.B., N.V. Parin, and M.S. NIZINSKI. Catalog of type-specimens of Recent fishes in the National Museum of Natural History, Smithsonian Institution. 3. Beloniformes (Teleostei). Smithsonian Contrib. Zool.

FARFANTE, I. and L. Robertson. Hermaphroditism in the penaeid shrimp Penaeus vanamei (Crustacea: Decapoda: Penaeidae). Aquaculture.

Hanlon, R.T., S.v. Boletzky, T. Okutani, G. Pérez-Gandaras, P. Sanchez, C. Sousa-Reis, and M. VECCHIONE. Suborder Myopsida Orbigny, 1845. In: "Larval" and Juvenile Cephalopods. A Manual for Their Identification. M. J. Sweeney et al., eds. Smithson. Contrib. Zool.

MUNROE, T.A. Interdigitation pattern of dorsal-fin pterygiophores and neural spines, an important diagnostic character for symphurine tonguefishes (Symphurus: Cynoglossidae: Pleuronectiformes). Bull. Mar. Sci.

PAPERS IN PRESS (Continued)

RAJAGURU, A. and G. Shantha. The sessile barnacle, Xenobalanus globicipitis (Coronulidae) from the bottlenose dolphin, Tursiops truncatus (Delphinidae), with a summary of previous records from cetaceans. Fish. Bull., U.S.

Roper, C.F.E. and M. VECCHIONE. The Gilbert L. Voss Memorial Issue. Foreword. Bull. Mar. Sci.

Roper, C.F.E. and M. VECCHIONE. A geographic and taxonomic review of Taningia danae Joubin, 1931 (Cephalopoda: Octopoteuthidae), with new records and observations on bioluminescence. Bull. Tokai Reg. Fish. Res. Lab.

Van Dover, C.L. and A.B. WILLIAMS. Egg size in squat lobsters (Galatheoidea): constraint and freedom. Crustacean Issues, Balkema, Rotterdam.

VECCHIONE, M. Long-term trends in the abundance of the copepod Acartia tonsa in the Calcasieu Estuary. Contr. Mar. Sci.

VECCHIONE, M. A method for examining the structure and contents of the digestive tract in paralarval squids. Bull. Mar. Sci.

VECCHIONE, M. and C.F.E. Roper. Cephalopods observed from submersibles in the western North Atlantic. Bull. Mar. Sci.

VECCHIONE, M., B.H. Robison, and C.F.E. Roper. A tale of two species: tail morphology in paralarval Chiroteuthis. Proc. Biol. Soc. Wash.

WILLIAMS, A.B. Reflections on crab research in North America since 1758. Crustacean Issues. A. A. Balkema/Rotterdam.

Williams, A.B. (Book Review). H. J. Squires. 1990. Decapod Crustacea of the Atlantic Coast of Canada. Can. Bull. Fish. Aquat. Sci. 221: 1-532. J. Crust. Biol.

Young, R.E., K.M. Manold, and M. VECCHIONE. The enoploteuthid group of families. In: "Larval" and Juvenile Cephalopods. A Manual for Their Identification. M. J. Sweeney et al., eds. Smithson. Contrib. Zool.

COMPLETED MANUSCRIPTS

Anderson, W.D., Jr., P.J. Kailola, and B.B. COLLETTE. Two new species of snappers (Teleostei: Lutjanidae: Apsilinae: Paracaesio): one from the western Pacific and one from the western Indian Ocean. For Proc. Biol. Soc. Wash.

Hostetter, E.B. and T.A. MUNROE. Age, growth, and reproduction of tautog, Tautoga onitis (Linnaeus), (Labridae, Perciformes) from coastal waters of Virginia. For Fish. Bull., U. S.

Parin, N.V. and B.B. COLLETTE. Results of the research cruises of the FRV "Walther Herwig" to South America. LXIX. A new species of cutlassfish (Scombroidei: Trichiuridae: Lepidopus) from the western Atlantic Ocean. For Arch. FischWiss.

RAJAGURU, A. Biology of two co-occurring tonguefishes, Cynoglossus arel and C. lida (Pleuronectiformes: Cynoglossidae) from Indian waters. For: Fish. Bull., U.S.

VECCHIONE, M. Ontogenetic characters and cephalopod systematics. In: Systematics and Biogeography of Cephalopods. N. A. Voss, M. Vecchione and R. Toll (eds.). For: Smithsonian Contrib. Zool.

VECCHIONE, M. Zooplankton of Calcasieu Estuary. For: Estuaries.

VECCHIONE, M. and K.L. Mayne. Larval distribution in an artificial estuary. For: NOAA Tech. Rept.

VECCHIONE, M., T.F. Brakoniecki, Y. Natsukari, and R.T. Hanlon. Family Loliginidae. In: Systematics and Biogeography of Cephalopods. N. A. Voss, M. Vecchione and R. Toll (eds.). For: Smithsonian Contrib. Zool.

VECCHIONE, M., C.F.E. Roper, C.C. Lu, and M.J. Sweeney. Development, distribution, and relative abundance of paralarval cephalods in the western North Atlantic. For: Smithsonian Contr. Zool.

WILLIAMS, A.B. and R. Wahle. Distinguishing juvenile stages of Jonah and Atlantic rock crabs, Cancer borealis and C. irroratus (Crustacea: Decapoda: Cancridae). For: J. Crust. Biol.

STAFF

Bruce B. Collette	Laboratory Director and Ichthyologist
Isabel C. Canet (Pérez Farfante)	Carcinologist Emeritus
Thomas A. Munroe	Ichthyologist
Michael Vecchione	Squid Biologist
Austin B. Williams	Carcinologist
Grace Klein-MacPhee	Fishery Biologist
Keiko H. Moore	Scientific Illustrator
Virginia R. Thomas	Secretary
Martha Nizinski	Zoologist
Deborah Rothwell	Museum Specialist (from August)
Kon Rhyu	Museum Specialist (from September)
Maureen Aninye	Biological Aide (Temporary)
Alsane Soumah	Museum Aide (Temporary)
Elizabeth Keane	Biological Lab. Technician (from June)
A. Rajaguru	Visiting Investigator
David Stein	Visiting Investigator
Janet Nestlerode	Volunteer (from October)